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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/855,972	05/15/2001	Kevin P. Martin	062002-1751	1603

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EXAMINER

HASSANZADEH, PARVIZ

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 07/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/855,972

Applicant(s)

MARTIN ET AL.

Examiner

Parviz Hassanzadeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36,39,40,43 and 44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 36,39,40,43 and 44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “pulse waveform power source adapted ..” must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 36, 39, 40, 43 and 44 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation “pulse waveform power source adapted ..” as recite claim 36 is not supported by the specification including the drawings.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 36, 39, 40, 43, 44 are rejected under 35 U.S.C. 102(b) as being anticipated by Doki et al (US Patent No. 5,310,452).

Doki et al teach an apparatus (Fig. 1) for plasma etching a substrate 14, the apparatus comprising:

a plasma processing chamber 9 coupled to a plasma generating chamber 3 wherein a plasma is generated by microwave generating 17 (*plasma reactor having a plasma creation means, the plasma reactor adapted to have a plasma at a first electrical potential therein*);

a substrate board 10 (*mechanical support within the plasma reactor*), wherein the sample table 10 is coupled to an RF power source 20 and a DC power source 32 for applying a bias voltage on the substrate board 10; and

a synchronization pulse generating circuit 22 coupled to a plasma power source 17 and a substrate bias power sources 20 and 32 such that pulsed bias potential is applied to the substrate (abstract, column 2, line 18-54, and column 8, line 36 through column 9, line 65).

Regarding process limitations as recited in claims 36, 39, 43, 44: The apparatus is inherently capable of being operated under the condition cited in the claims, that is, electrically biasing to a first electrical potential to neutralize the substrate and to a second potential to etch the substrate by plasma electrons. It has been held that claims directed to apparatus must be

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distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); “Apparatus claims cover what a device is, not what a device does” (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Further regarding claim 40: the apparatus of Doki et includes a direct current power source 32 coupled to the substrate support 10.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 36, 39, 40, 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaji et al (US Patent No. 5,290,993) in view of Doki et al (US Patent No. 5,310,452).

Kaji et al teach an apparatus (Fig. 1) for plasma etching a sample 14, the apparatus comprising:

a bell jar 3 and a vessel 4 defining a plasma generating and plasma processing space (*plasma reactor*), wherein the plasma is generated by a microwave generator 1 (*having a plasma creation means*); and

a sample table 10 (*mechanical support within the plasma reactor*), wherein the sample table 10 is coupled to an AC power source 16 and a DC power source 18 for applying a bias voltage on the sample table 10 (*the support is electrically connected to both a dc and an ac bias source*) (column 2, line 41 through column 3, line 41).

Kaji et al fail to teach the bias power source being a pulse power source.

Doki et al teach a plasma reactor (Fig. 1) including a synchronization pulse generating circuit 22 coupled to a plasma power source 17 and a substrate bias power source including an RF generator 20 and a DC generator 32 such that bias potential is applied to the substrate in pulse mode at the same time the plasma power source is applying power to the plasma (abstract and column 8, line 36 through column 9, line 65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the synchronized pulsed bias potential mechanism as taught by Doki et al in the apparatus of Kaji et al in order to synchronize the plasma generating power with the bias potential.

Regarding process limitation (wherein the positive potential is such that electrons having kinetic energy less than 100 ev are attracted to the substrate): The apparatus is inherently capable of being operated under the condition cited in the claims, that is, electrically biasing to a first electrical potential to neutralize the substrate and to a second potential to etch the substrate by plasma electrons. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); “Apparatus claims cover what a device is, not what a device does” (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Claims 36, 39, 40, 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okano et al (JP 56-81678-A) in view of Doki et al (US Patent No. 5,310,452).

Okano et al teach an apparatus (Fig. 5) for plasma etching a material, the apparatus comprising:

a *plasma reactor* 36, wherein the plasma is generated by a high frequency power source 31 coupled to discharge electrodes 28, 29 (*having a plasma creation means*); and

an electrode 25 supporting a material 26 to be etched (*mechanical support within the plasma reactor*), wherein the material support electrode 25 is coupled to an AC power supply 33 and a DC power supply 35 for applying a superimposed bias current on the material support

electrode 25 (*the support is electrically connected to both a dc and an ac bias source*) (abstract describing Fig. 3 having components similar to those shown in Fig. 5).

Okano et al fail to teach the bias power source being a pulse power source.

Doki et al teach a plasma reactor (Fig. 1) including a synchronization pulse generating circuit 22 coupled to a plasma power source 17 and a substrate bias power source including an RF generator 20 and a DC generator 32 such that bias potential is applied to the substrate in pulse mode at the same time the plasma power source is applying power to the plasma (abstract and column 8, line 36 through column 9, line 65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the synchronized pulsed bias potential mechanism as taught by Doki et al in the apparatus of Okano et al in order to synchronize the plasma generating power with the bias potential.

Regarding process limitation (wherein the positive potential is such that electrons having kinetic energy less than 100 ev are attracted to the substrate): The apparatus is inherently capable of being operated under the condition cited in the claims, that is, electrically biasing to a first electrical potential to neutralize the substrate and to a second potential to etch the substrate by plasma electrons. It has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. *In re Danley*, 120 USPQ 528, 531, (CCPQ 1959); “Apparatus claims cover what a device is, not what a device does” (Emphasis in original) *Hewlett-Packard Co. V. Bausch & Lomb Inc.*, 15USPQ2d 1525, 1528 (Fed. Cir. 1990); and a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if

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the prior art apparatus teaches all the structural limitations of the claim *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Also see MPEP 2114.

Response to Arguments

Applicant's arguments with respect to claims 36, 39, 40, 43 and 44 have been considered but are moot in view of the new ground(s) of rejection.

Applicants assert that neither of the prior art of record teach a pulse power supply in an ion enhanced etching plasma reactor.

The Examiner argues the pulsed bias power source in plasma etching reactor is known in the art and for the record the present office action has included some the arts implementing a bias power source which is pulsed.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tamura et al (US Patent No. 5,906,684) teach a plasma reactor including a substrate holding system coupled to both a DC power source 13 and an AC power source 12 (Fig. 10);

Ooiwa et al (US Patent No. 4,891,118) teach an RF bias power source which is pulsed by a synchronization pulse generator circuit;

Kofuji et al (US Patent No. 6,231,777 B1) teach a plasma reactor including a pulsed bias voltage source for controlling charge build up on a substrate;

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Savas (US Patent No. 5,983,828) teaches a plasma reactor including a pulsed bias power source; and

Grunwald (US Patent No. 4,863,549) teaches a plasma reactor including a bias power source having a pulse width modulator

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.

P. Hassanzadeh
Parviz Hassanzadeh
Primary Examiner
Art Unit 1763

July 2, 2003